Simpson

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OPERATOR'S MANUAL

MIDGETESTER
MODEL 355

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago, Illinois 60644
Area Code 312, Telephone 379-1121
In Canada, Bach-Simpson, Ltd., London, Ontario

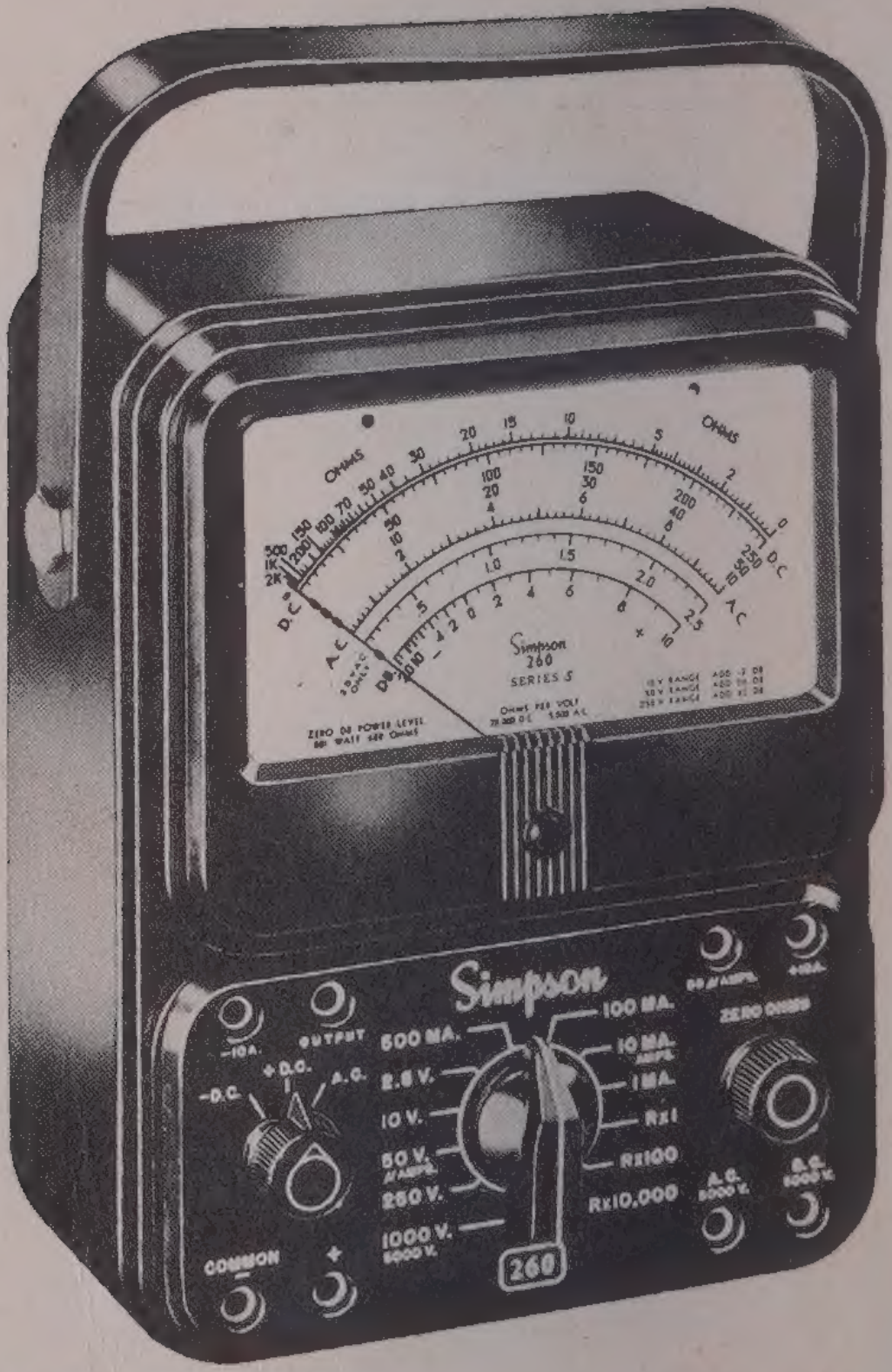

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FIGURE 1. SIMPSON MIDGETESTER

OPERATOR'S MANUAL
SIMPSON MIDGETESTER MODEL 355

SECTION I
GENERAL DESCRIPTION

INTRODUCTION

The SIMPSON MIDGETESTER brings you a self shielded meter movement in a shirt pocket size tester!

The Simpson Midgetester Model 355 is an ultra-compact self-shielded *volt-ohmmeter*, designed to satisfy the requirements of a large variety of *electrical* and *electronic* servicemen. It is *unique* in several respects. It is the *smallest size* and *lightest weight* tester available with *high standards of quality*. It has the famous Simpson *Core Magnet Meter Movement* and the recognized *accuracy* and *ruggedness* which have made Simpson instruments

the standard against which all others are compared.

DIMENSIONS

The Model 355 is so small that you can put it in your shirt pocket! It measures 2¾" x 4½" x 1" overall. It has a *smooth plastic case* which surrounds the entire instrument. There is a *clear plastic face* over the front of the instrument, and a *black plastic cover* over the back.

TEST LEADS

There is a pair of *special test leads* furnished with each instrument, one red and one black for easy polarity indications. Each has a partially *threaded stud* on one end with which you will attach the lead to the instrument. The contacts into which the studs fit are all on the face of the Model 355

directly below the meter. When you attach the *leads* in these *contacts*, you automatically *select* the type of *circuit* and *range* for which the instrument is set.

STUDS ARE PARTIALLY THREADED

The *threads* on the studs which fit in the contacts will aid in making a definite contact for the *circuit connection* each time you screw them into the contacts. They will also *maintain* whatever circuit and range you select while you use it; the leads will not come out of the meter until you unscrew the threads. So they provide an advantage both *electrically* and *mechanically*.

SHARP TIPS ON PROBE

The probe end of each lead has a *sharp pointed contact* to help you reach the

point of contact which you want, even though it is in a crowded area. The sharp point will help you *hold* it exactly where you want it while you make the reading. The *probe end* also has a *shoulder* over which you can slip the *alligator clip assembly* if you wish to have a *clip termination* at any time.

5,000 VOLT INSULATION

The *plastic cover* over each *termination* of the test leads *safeguards* the operator from *touching* any *voltage* which is contacted with the probe. The lead wire itself has an *insulation* rating of 5,000 *volts*, and will complete the *isolation* and *protection* to the *operator* which he needs.

1% CARBO FILM RESISTORS

The *electrical circuit* has been *de-*

signed to provide maximum *insurance* against *damage* to the component parts. *Very accurate carbofilm* resistors are used to assure *long life and dependability*. The rectifier for A.C. voltage measurements is of the *full wave bridge* type to provide *vibration-free* operation of the meter at *all frequencies*. The *batteries* will have a *long life* under normal use, because their maximum *current* is held to a small amount.

100 MICROAMPERES-BASIC SENSITIVITY

The *indicating meter* has a sensitivity of *78 microamperes*. This is *shunted* for all *measurements* so the meter circuit has a *basic sensitivity of 100 microamperes*. For the first time in any commercial multi-tester, the *sensitivity* for A. C. *voltage measurements is 10,000 ohms-per-volt!* This means that the Simpson *Midgetester*

Model 355 can and will give you *less loading* and *more accurate measurements* of A.C. voltage in *high impedance* circuits than has ever been available before. This is especially valuable for measuring the *output voltage* coming out of a high impedance secondary winding of a transformer.

The comfortable *plastic cover* over the instrument is easy to hold in one hand. It also can be *laid on any surface* where you are working because it completely *insulates* the *instrument* from all outside contacts except those which you make with the test leads. The short length of both *test leads* requires that you place the Midgetester *close* to the point where you are making a measurement. This brings the *meter*, the *points* which you contact, and the

circuit in which you are measuring electrical characteristics, all within your angle of vision. This will make your *work* more *efficient* and will help *prevent errors*. Proximity to voltages which would normally cause deflection errors *will not matter* when you use the Midgetester. The *movement* is *self shielded* to prevent any such interference.

ACCURATE INDICATIONS IN ALL POSITIONS

The *instrument* will indicate in whatever *position* it is placed. But it is characteristic of any indicating mechanism to exhibit less pivot friction when it has its *pivots* on a *vertical alignment*. This condition is obtained when the instrument is *horizontal*.

MEASUREMENT ACCURACY

Measurement *accuracy* is 3% D.C. and 5% A.C. of full scale voltages, and within 3° of arc from absolute value of resistance being measured.

OHMS ZERO ADJUST

The *zero adjustment* for all ohmmeter ranges is located in a recessed pocket on the *right hand side* of the instrument at the side of the indicating meter. The *knob* has a *ribbed surface* on the side to make it easy for you to turn. The fact that it is *slightly recessed* makes it less likely that you will accidentally move it while you are using the instrument.

REMOVING THE COVERS

The *front cover* and the *back cover* are each attached to the plastic instrument chassis with *four screws*. To

remove either of these covers, take out the four mounting screws and separate the cover from the chassis. The *front cover mounting screws* are on the *sides* of the case; two are on the left and two are on the right. The *back cover* has one *mounting screw* near each of the four corners.

LOCATION OF BATTERIES

For access to the *batteries* or other *component parts* on the rear of the instrument, remove the *four screws* which hold the *back cover* in place, and take off cover.

MEASUREMENT RANGES AVAILABLE

a. D.C. Voltage

0-3 volts *0-12 volts* *0-60 volts* *0-300 volts* *0-1200 volts*	*10,000 ohms per volt sensitivity*

b. A.C. Voltage

0-3 volts *0-12 volts* *0-60 volts* *0-300 volts* *0-1200 volts*	*10,000 ohms per volt sensitivity*

c. D.C. Resistance

0-10,000 ohms	*(120 ohms center)*
0-100,000 ohms	*(1200 ohms center)*
0-1 megohm	*(12,000 ohms center)*
0-10 megohms	*(120,000 ohms center)*

D. C. VOLTAGE MEASUREMENTS

Measure D.C. voltage by applying the test leads across the unknown voltage to connect it to the indicating meter and its fixed shunt resistors within the Model 355. The meter movement and its shunt have an equivalent resistance of 1500 ohms; 100 microamperes through this circuit will cause the meter to be deflected to full scale. The series resistors increase the total instrument resis-

tance to *10,000 ohms per volt* for all D.C. voltage ranges.

A.C. VOLTAGE MEASUREMENTS

A.C. voltage measurements are made by rectifying the A.C. voltage with an internal *full wave bridge type instrument rectifier*. The resulting D.C. voltage causes a proportional current to flow through the meter. An internal *shunt* resistor, individually *calibrated* to the characteristics of each meter and rectifier, is connected in parallel with the meter and rectifier. The same set of series resistors as were used for D.C. voltage ranges will increase the total instrument resistance to *10,000 ohms per volt* for A.C. voltage ranges also.

D.C. RESISTANCE MEASUREMENTS

Two internal *batteries* are used to furnish the required power for making *resistance measurements* with the Model 355 Midgetester. *A low voltage* battery (1.5 volts) furnishes the power for the *lowest three ranges*, and a *high voltage* battery (15 volts) is added in *series* to the *low voltage* battery for power for the *highest* range. The internal circuits contain *precision* series and shunt resistors to produce *accurate* indications of *resistance* values. The *most current* which will flow through an *external resistor* being measured is dependent on the range which you use. The maximum current values are as follows:

RANGE	*CURRENT*
OHMS X1	*12.5 milliamperes*
OHMS X10	*1.25 milliamperes*
OHMS X100	*125. microamperes*
OHMS X1000	*137.5 microamperes*

When you measure *forward* and *backward resistance* of rectifiers or of electrolytic capacitors, consider the *polarity* of the *test leads*. The *black* test lead, connected to the OHMS contact is the source of *negative* voltage; and the *red* test lead, connected in one of the range contacts, is the source of *positive* polarity.

SECTION II
OPERATING INSTRUCTIONS

ZERO ADJUSTMENT: Before making any measurements, check to see that the pointer indicates zero when the meter is in its operating position. If the pointer is off zero, adjust the *plastic screw* located in the front panel at the bottom of the raised portion of plastic over the meter movement. Use a small screwdriver to

turn this screw *slowly* clockwise or counterclockwise until the *pointer* rests exactly over the *zero* mark at the left side of the scale.

D.C. VOLTAGE MEASUREMENTS

BLACK TEST LEAD

Place the end of the *black test lead* which has the threaded stud in the contact point marked *-DCV* at the upper left hand corner of the group of contact points on the front panel. Press it in until the *threads* meet the top of the contact and then *screw* it into the contact. This should take from 1½ to 2 turns of the lead tip to *seat* it.

RED TEST LEAD

Place the end of the *red test lead* which has the threaded stud into

the contact point which is marked with the *range* desired. These contacts, and the ranges which they will set up are: 3, 12, 60, 300, and 1200. *WHEN IN DOUBT AS TO THE VOLTAGE PRESENT, ALWAYS USE THE HIGHEST RANGE AS A PROTECTION TO THE INSTRUMENT.* *After* you observe the *first reading*, you can *change* the connection of the *red test lead* to *decrease* the *range* if the voltage is within the lower range. Screw the tip of the red test lead into the contact which you have selected. See Figure 3.

ALLIGATOR CLIPS

If you desire *clip* contacts for the *probe tips*, slip a special alligator clip assembly over the shoulder on the probe end of each test lead.

PROBE ENDS

Connect the probe end of the *black test lead* to the *negative* side of voltage which you wish to measure. *Connect* the probe end of the *red test lead* to the *positive side.*

REVERSED CIRCUIT

Turn on the *power* in the circuit to be measured. *If* the *pointer* deflects to the *left* of *zero,* the lead *connections* are *reversed.* Turn off the power and reverse the connections of the test probes. Then turn the power on again.

READING THE SCALES

Read the *voltage* on the *black arc* marked D.C.V. on the meter dial. For the 3 volt range, use the figures 0 to 300 and divide by 100. For the 12 volt range, read the value directly with

the figures 0 to 12. For the 60 volt range, read the value directly with the figures 0 to 60. For the 300 volt range, read the value directly with the figures 0 to 300. For the 1200 volt range, use the figures 0 to 12 and multiply by 100.

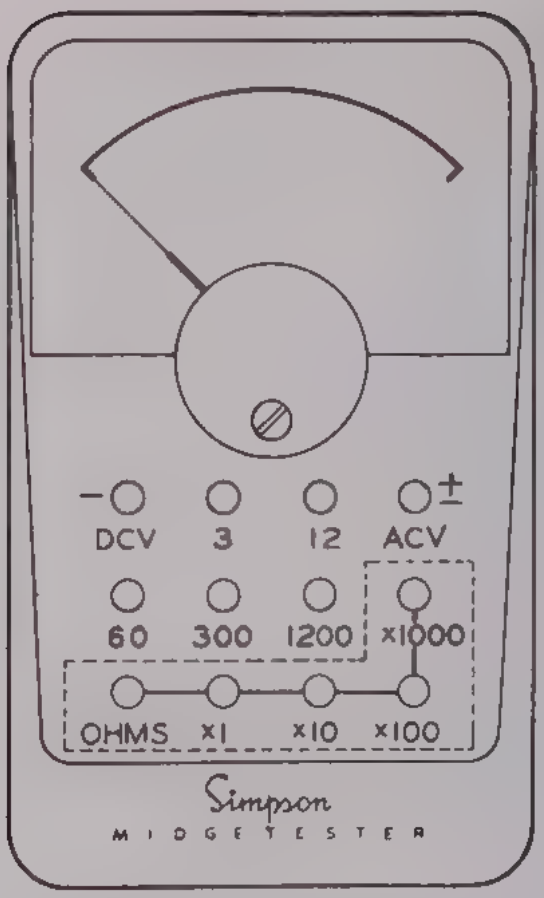
TURN OFF POWER

Turn off the power before you disconnect the meter leads.

A.C. VOLTAGE MEASUREMENTS

BLACK TEST LEAD

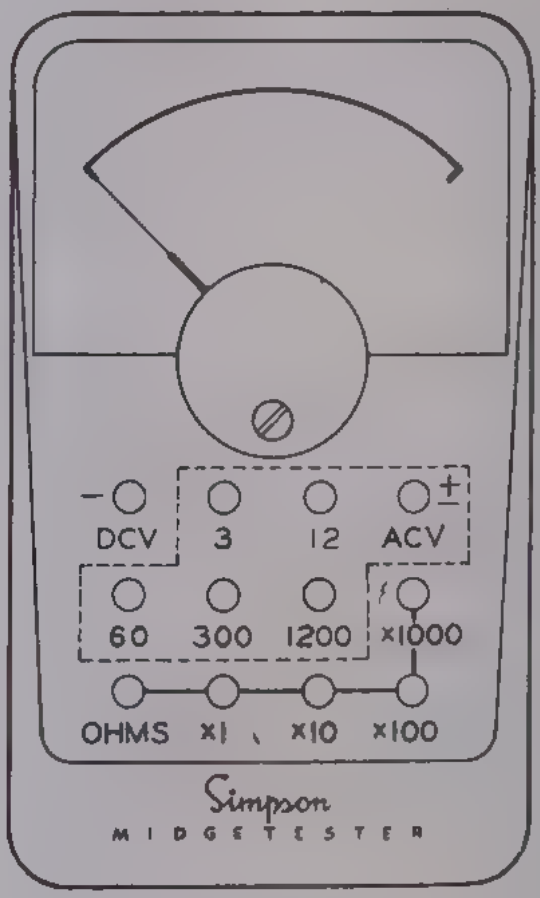
Place the end of the *black test lead* which has the threaded stud in the contact point marked *ACV* at the upper right hand corner of the group of contact points on the front panel. Press it in until the *threads* meet the top of the contact and then *screw* it



CONTACT POINTS FOR RESISTANCE RANGE SELECTIONS.

OHMS

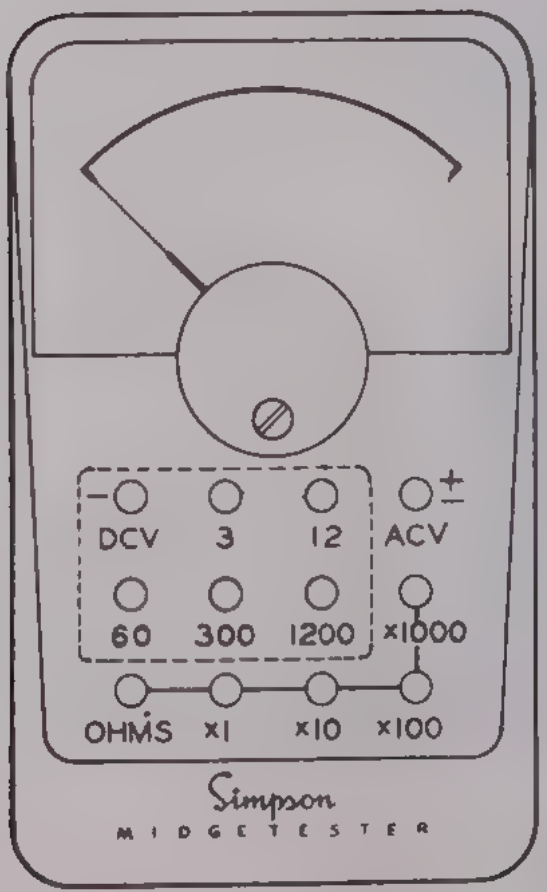
FIG. 2



A.C. VOLTS

FIG. 4

CONTACT POINTS FOR A.C. VOLTAGE RANGE SELECTIONS.



D.C. VOLTS

FIG. 3

CONTACT POINTS FOR D.C. VOLTAGE RANGE SELECTIONS.

into the contact. It should take from 1½ to 2 turns of the lead tip to *seat* it.

RED TEST LEAD

Place the end of the *red test lead* which has the threaded stud into the contact point which is marked with the *range* desired. These contacts, and the ranges which they set up, are 3, 12, 60, 300, and 1200. *WHEN IN DOUBT AS TO THE VOLTAGE PRESENT, ALWAYS USE THE HIGHEST RANGE AS A PROTECTION TO THE INSTRUMENT. After* you observe the *first reading,* you can *change* the connection of the *red test lead* to *decrease* the *range* if the voltage is within the lower range. Screw the tip of the red test lead into the contact which you have selected. See Figure 4.

ALLIGATOR CLIPS

If you desire *clip* contacts for the *probe tips,* slip a special alligator clip assembly over the shoulder on the probe end of each lead.

PROBE ENDS

Connect the probe end of the *black test lead* to *one* side of the voltage which you wish to measure, and the *red test lead* to the *other* side. There is no polarity which must be observed when making A.C. measurements.

TURN ON POWER

Turn on the power in the circuit which is to be measured.

READING THE SCALES

Read the *voltage* on one of the *red arcs* on the dial. For the 3 volt range, use the inner arc marked 3

A.C.V., and read the voltage directly. For the 12 volt range, read the voltage with the red arc marked A.C.V. and the corresponding figures 0 to 12. For the 60 volt range, read the voltage with the red arc marked A.C.V. and the corresponding figures 0 to 60. For the 300 volt range, read the voltage with the red arc marked A.C.V. and the corresponding figures 0 to 300. For the 1200 volt range, read the voltage with the red arc marked A.C.V. and the corresponding figures 0 to 12; multiply your reading by 100.

ROOT MEAN SQUARE VALUES

NOTE: All A.C. voltages indicated with the Simpson Midgetester Model 355 are RMS values based on full wave rectification. If the input voltage is a sine wave, multiply the indicated value by 2.828 for the

peak-to-peak value, or by 1.414 for the peak value.

TURN OFF POWER

Turn off the power before you disconnect the meter leads.

D.C. RESISTANCE MEASUREMENTS

CAUTION: *Before you make any resistance measurements* in an electrical or electronic circuit, be sure the *power* is turned *off* and all *capacitors* are *discharged,* so that *no voltage exists.* Otherwise you may damage your meter circuits.

BLACK TEST LEAD

Place the end of the *black test lead* which has the threaded stud into the contact point marked *OHMS* at the lower left hand corner of the group of contact points on the front

panel. Press it in until the *threads* meet the top of the *contact* and then screw it into the contact. 1½ to 2 turns of the lead tip should *seat* it.

RED TEST LEAD

Place the end of the *red test lead* which has the threaded stud into the contact point marked with the *multiplier value* which will set up the desired *range* for resistance measurements. Screw it into the contact. See Figure 2.

OHMS ZERO ADJUST

Short the *probe tips* of the two leads *together* and *observe* the indication on the *meter*. It should register *full scale deflection* for zero ohms. If it does not read zero (at the right hand end of the top arc of the meter), *adjust* the *control knob* which is *recessed* near the top of

the *right hand side* of the instrument until the *meter* does read *zero*. If you cannot get enough deflection to read zero, one or both *batteries* need to be replaced. See instructions in the MAINTENANCE SECTION of this manual.

CENTER SCALE READINGS ARE BEST

Separate the *test probes* and *connect* them across the *resistance* of the portion of the circuit which is to be measured. The most *accurate resistance reading* is obtained on the range which produces the reading *closest* to the *center of the scale*.

NOTE: Readjust the zero indication with the probes shorted each time you *change the resistance range*.

READING THE SCALES

Read the value indicated on the

arc marked *OHMS*. This is printed at the top of the dial. Note that the scale *increases* from *right to left*. For the OHMS X1 range, read the resistance directly in ohms. (K=1000) For the OHMS X10 range, multiply the reading by 10 (add one zero). For the OHMS X100 range, multiply the reading by 100 (add two zeros). For the OHMS X1000 range, multiply the reading by 1000 (add three zeros). CAUTION: *Do not leave the leads* connected in a position which sets up your Model 355 for *resistance* measurements when it is not in use. The *test leads* may become *shorted* together and cause unnecessary *drain* through the *batteries*. This will wear out the batteries in a shorter-than-normal time, and require that they be *replaced*.

SECTION III
FUNCTIONING OF PARTS

SCHEMATIC DIAGRAM

The complete *schematic diagram* of the Simpson *Midgetester Model 355* is shown in figure 5. Each of the *twelve contact points* which are on the front panel are shown as *open circles*, and the front panel marking is shown to identify each contact.

SCREW THE LEADS IN

For all *D.C. voltage measurements*, you will insert the *black test lead tip* into the contact marked *-DCV*. When you screw it into the contact, the end will push against a phosphor bronze spring *switch* which is mounted *under* the *contact* inside the case. The three leads which are connected with

this switch are shown at the end of the broken line from the -DCV circle in the schematic. There is a fibre *insulator between* the end of the *stud* and the *switch* which prevents any electrical contact between them. If you do not screw the tip of the lead all the way into the contact receptacle, this switch will not be closed, and the meter circuit will not be complete.

HOW SWITCHES ARE CLOSED

When you *insert* the *tip* of the *black test lead* into the *ACV* contact, it presses against the leaves of another *switch* to close the proper circuit for measuring A.C. voltages. Likewise, when you *screw* the *tip* into the *OHMS* contact, you will close the *switch* for the resistance circuit.

TRACING EACH CIRCUIT

By knowing that these *switches* are *operated* with the *tip* of *the black test lead*, and yet are insulated from it, you can trace out each circuit in the instrument.

METER MOVEMENT SHUNTED

For *D.C. voltage* measurements, the *movement* and its *series resistor* are connected in parallel with the 5455 ohm *shunt* to create a resulting resistance of 1500 ohms. When 100 microamperes flows through this circuit, 78 microamperes will flow through the meter and the other 22 microamperes will flow through the shunt. The 78 microamperes through the meter will cause full scale deflection. Any fractional part of 100 microamperes through the circuit will cause a proportional part of 78

FIGURE 5. OVERALL SCHEMATIC DIAGRAM, MODEL 355

microamperes to flow through the meter movement, and it will be deflected through a proportional part of its full scale.

28500 OHM RESISTOR FOR 3 VOLT

If the *red test lead* is connected to the 3 *volt* contact, there is a *28500 ohm resistor* added in *series* to the meter circuit. The total instrument resistance is *30,000 ohms*, which is 10,000 ohms per volt for 3 volts. *Other ranges* add *more series resistance* in the circuit to make up the total of 10,000 ohms per volt for each range. When you connect the test leads across a source of *voltage equal to the range value*, the instrument resistance will allow *100 microamperes* of current to flow. This will cause the meter to indicate *full scale*. When you contact any

fractional part of the *full scale value* of voltage with the test leads, a *proportional fraction* of 100 microamperes will flow through the instrument and will cause a proportional fractional deflection on the meter.

INTERNAL RECTIFICATION FOR A.C.

For *A.C. voltage* measurements, the *meter* and its *series resistor* are connected in *series* with two of the four parts of the *rectifier* for each half cycle. Current always passes in the same direction through the meter on both half cycles. The fixed A.C. calibration resistor is selected to match the characteristics of each individual rectifier and regulate the deflection on the meter for RMS indications of the voltages which you read.

SERIES MULTIPLIERS

The same *series multiplier resistors* are used for A.C. voltage ranges as for D.C. voltages, because the sensitivity of the meter is the same for both types of circuits.

BATTERIES FOR OHMS READINGS

For *resistance measurements,* the power is furnished by one or both of the *batteries* which are located in the case of the instrument. When you connect the *black test lead* in the contact marked *OHMS* and the *red test lead* in one of the *multiplier range* contacts, you automatically connect the battery or batteries and the proper series and shunt resistors for that range. When the internal resistance of the ohmmeter circuit is connected across the battery by shorting the two test probes together, the ohmmeter zero

adjustment knob in the right hand side of the case can be turned to tap the amount of resistance which will allow 78 microamperes of current to flow through the meter movement. This current deflects the pointer to full scale and indicates that there is no resistance between the test probes. When the test probes are connected across some value of resistance, the total resistance across the battery is increased, and the current flow is decreased. With less current flowing through the meter movement, the pointer will not be deflected as far, and the reduced deflection indicates the number of ohms added between the test probes.

ADDING EXTERNAL RESISTANCE

When the *added resistance is equal* to the *instrument circuit resistance,*

the *total resistance* through which battery current passes is doubled. This reduces the battery current, and the *meter current*, to *half* their former values. With half as much current flowing through the meter, the *pointer* will be deflected to *half scale*. For the OHMS X1 range, the center scale indication is 120 ohms. For the OHMS X10 range it is 1200 ohms. For the OHMS X100 range it is 12,000 ohms. And for the OHMS X1000 range it is 120,000 ohms. Other values of added external resistance will allow proportional pointer deflections, and each value can be calculated by reading the OHMS arc at the top of the dial, and then multiplying the reading by the amount indicated at the range contact which you are using.

SECTION IV
MAINTENANCE

PRECAUTIONS

When you handle your Model 355 Midge-tester, always be *careful* to *protect* it from shock and rough treatment. The instrument has a *delicate movement* which can be damaged if you do handle it in a rough and careless manner. However if you *handle it carefully,* your Model 355 will furnish *many years* of *trouble-free service* with all the advantages of its small size and high sensitivity. When the *instrument* is *not in use,* remove the test leads from the contacts. This will help to preserve the life of the contact springs and will prevent other damage which might occur.

PARTS AND REPLACEMENT

IF DAMAGE OCCURS . . . .

All resistors and other component parts of the Model 355 have been engineered to withstand more than the power which they should normally have to dissipate. But there are conditions under which *parts* may become *damaged or defective* and need replacement. Consult your circuit diagram, figure 5, to help identify any suspected part. A rear view inside the case of the model 355 appears in figure 6. *Open* the *case* of the instrument by *removing* the *four screws* through the *back cover*. The cover can then be lifted off to expose the parts inside.

ONE PIECE CONSTRUCTION

All the *components* are *attached* to the *chassis*, which is one piece. If

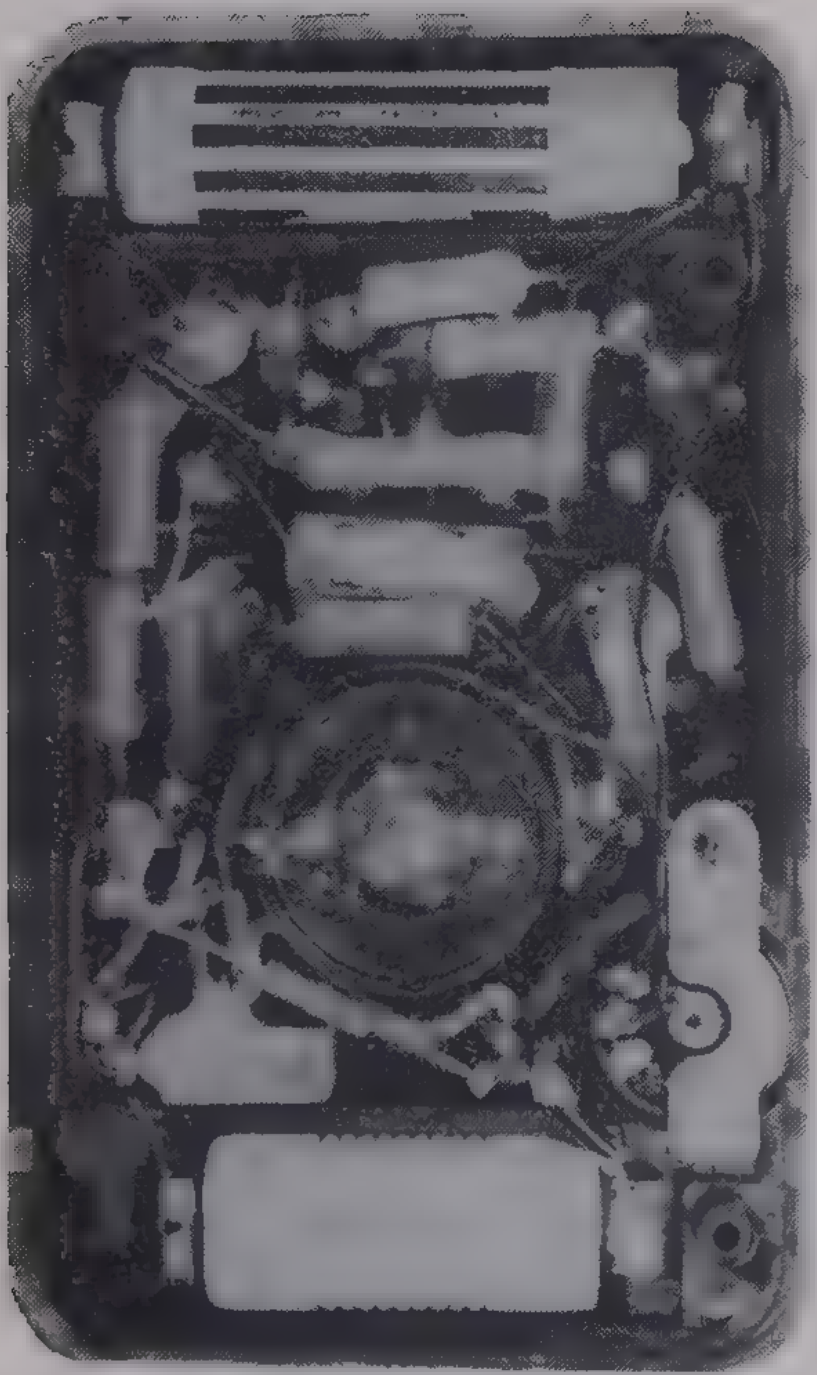


FIGURE 6. SIMPSON MIDGETESTER MODEL 355
REAR VIEW WITH COVER REMOVED

you must use a soldering iron to remove and replace any defective parts, be very careful to *prevent overheating* plastic insulation on the wires or the meter cover. Use a low wattage iron, and use it as sparingly as possible.

DON'T TOUCH METER MOVEMENT

If the meter movement is defective, do not attempt to repair it. Any repair of this delicate movement must be made by men who have been trained and who have the tools to do the job. Return the instrument to the nearest official Simpson repair station or return it to the factory. *Whenever you send any instrument in for repair,* always send along a statement to indicate exactly what is wrong with the instrument and what you wish to have done to it. This will *save you* both *time* and *money*.

BATTERY REPLACEMENT

USE OHMS ZERO ADJUST

The two *batteries* inside the case of the Model 355 will *wear out* gradually over a long period of time. During their usable life, the internal *battery resistance* will gradually *increase*, so the *terminal voltage* will *decrease* across the normal ohmmeter circuit load. The ohmmeter *zero adjustment*, on the right hand side of the case as viewed from the front, *compensates* the meter circuit for *normal aging* of the batteries. When the setting of this control fails to bring the pointer to full scale deflection with the test leads shorted together, one or both batteries must be replaced. If the *trouble* occurs on *all ranges*, replace the *1.5* volt battery first and then try the OHMS X1000 range. If the *trouble* occurs on the *OHMS X1000*

range, replace the *15 volt battery*. Use the following recommended replacements, or their exact equivalents in other brands:

1.5 volt cell

Burgess Battery Co. Type Z

15 volt battery

Eveready (National Carbon Co.) Type 404E

OBSERVE POLARITY

Whenever you *replace* either battery, be sure to *observe polarity*. As you view the battery compartments from the rear of the case as in figure 6, note that the positive polarity of both batteries is at the right hand side, and their negative polarities are at the left. A *mold mark* on the chassis near each battery compartment will identify the *positive* end. If either or both batteries are placed in their compartments with the polarity reversed, the meter will not indicate properly.

PARTS LIST

Description	*Simpson Part Number*
Resistor, 28,500 ohms, 1/2 W, 1%	1-114929
Resistor, 90,000 ohms, 1/2 W, 1%	1-113314
Resistor, 480,000 ohms, 1/2 W, 1%	1-115319
Resistor, 2.4 megohms, 1/2 W, 1%	1-113996
Resistor, 9 megohms, 1/2 W, 1%	1-115320
Resistor, 120 ohms, 1/2 W, 1%	1-115322
Resistor, 1080 ohms, 1/2 W, 1%	1-115323
Resistor, 90 ohms, 1/2 W, 1%	1-115324
Resistor, 10,800 ohms, 1/2 W, 1%	1-115325
Resistor, 7800 ohms, 1/2 W, 1%	1-115326
Resistor, 107,000 ohms, 1/2 W, 1%	1-115321
Resistor, 5,455 ohms, 1/2 W, 1%	1-115356
Potentiometer, 14,000 ohms (Ohmmeter zero)	1-114500
Front Cover	10-890168
Back Cover	1-115150
Rectifier and calibrating resistor	10-890302
Battery, 1.5 volt (Burgess Z cell)	1-111802
Battery, 15 volt(Eveready type 404E)	1-115329
Red and Black Test Lead Set	8600

SECTION V
SPECIAL APPLICATIONS

HIGH VOLTAGE MEASUREMENTS

HIGHER VOLTAGE RANGE

To set the voltage range at a higher value for either D.C. or A.C. voltages, it is necessary to add external series resistance to the internal resistance of the voltmeter circuits. Since the basic sensitivity is the same for either D.C. or A.C. voltage circuits, the same multiplier values can work for increasing the range for both types of circuits.

The total circuit resistance for any voltage range will be 10,000 ohms per volt. The voltage ranges which would be logical, using the calibration markings on the dial, would be 6000,

12000, and 30000 volts. For any of these ranges, add an external series resistor as shown in figure 7.

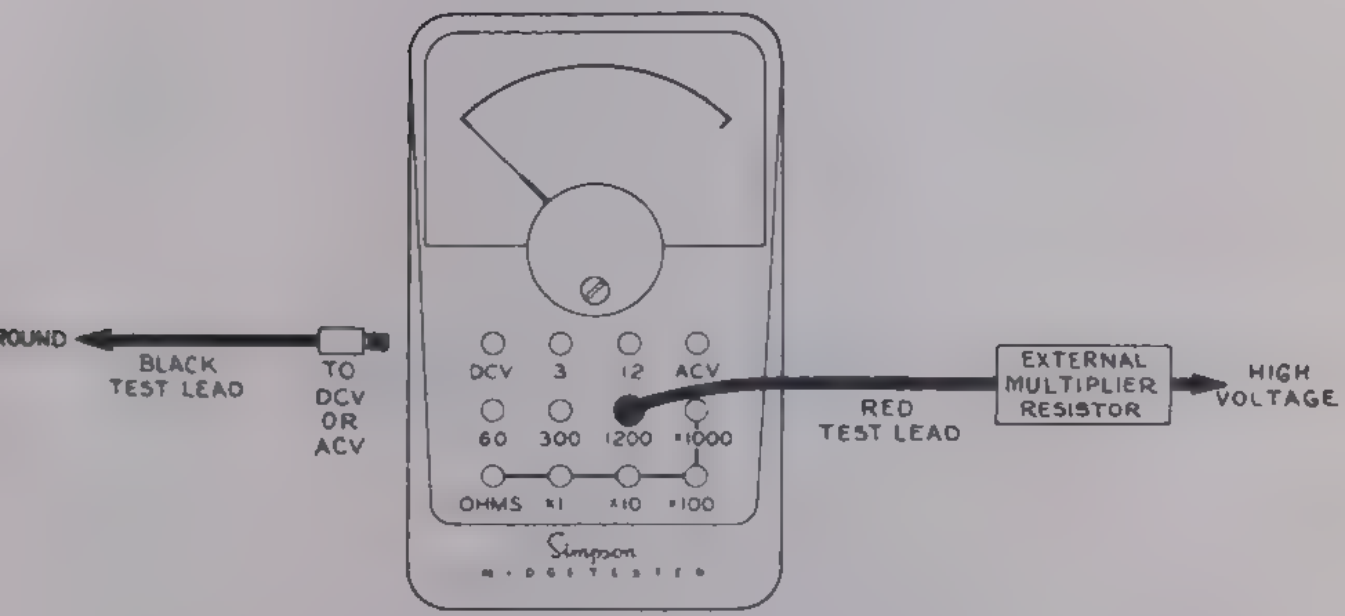


FIGURE 7. CONNECT AN EXTERNAL MULTIPLIER RESISTOR TO INCREASE THE VOLTAGE RANGES

CAUTION: When you set up a circuit for high voltage measurement, be sure that you do not touch any of the parts in the circuit while the voltage is present. Connect the leads to the circuit to be measured while power is off. Turn on the power to make the reading. Then be sure to turn off the power to remove the voltage before you disconnect the leads from the circuit.

EXTERNAL MULTIPLIER VALUES

Use the following values of external multiplier resistance to increase the ranges for both D.C. and A.C. voltages.

RANGE	*EXTERNAL RESISTANCE*
6,000 volts	*48 megohms, 1 watt*
12,000 volts	*108 megohms, 2 watts*
30,000 volts	*288 megohms, 5 watts*

Always connect the test leads in your Model 355 for a 1200 volt range when you use these values of external multiplier resistance.

MEASURING OUTPUT VOLTAGES:

A.C. VOLTAGE IN MIXED A.C./D.C.

Output voltage is the name applied to the A.C. voltage portion of mixed A.C. and D.C. voltages. To measure output voltage with the Simpson Midge-tester Model 355, set the circuit as for A.C. voltage measurements, and connect a capacitor between the red test lead and one side of the voltage source which you are measuring. Connect the capacitor in the circuit as shown in figure 8. Use as large a value of capacity as practical, but do not use electrolytics. Usually a value of 0.25 to 0.5 microfarad will

provide satisfactory results. The voltage rating of the capacitor will determine how much voltage you can measure. Do not exceed the rated value of the capacitor with the sum of both A.C. and D.C. voltages, or you may cause a short in the capacitor. This circuit is usable for measuring the A.C. voltage at the plate of an amplifier tube, the amount of ripple voltage in a power supply output, and many other similar conditions in which the two types are mixed. The indication will be only the A.C. component part.

D.C. VOLTAGE IN MIXED A.C./D.C.

To measure the D.C. component part alone, measure the voltage with the regular D.C. voltage circuits. The meter will not respond to the A.C. component for these measurements.

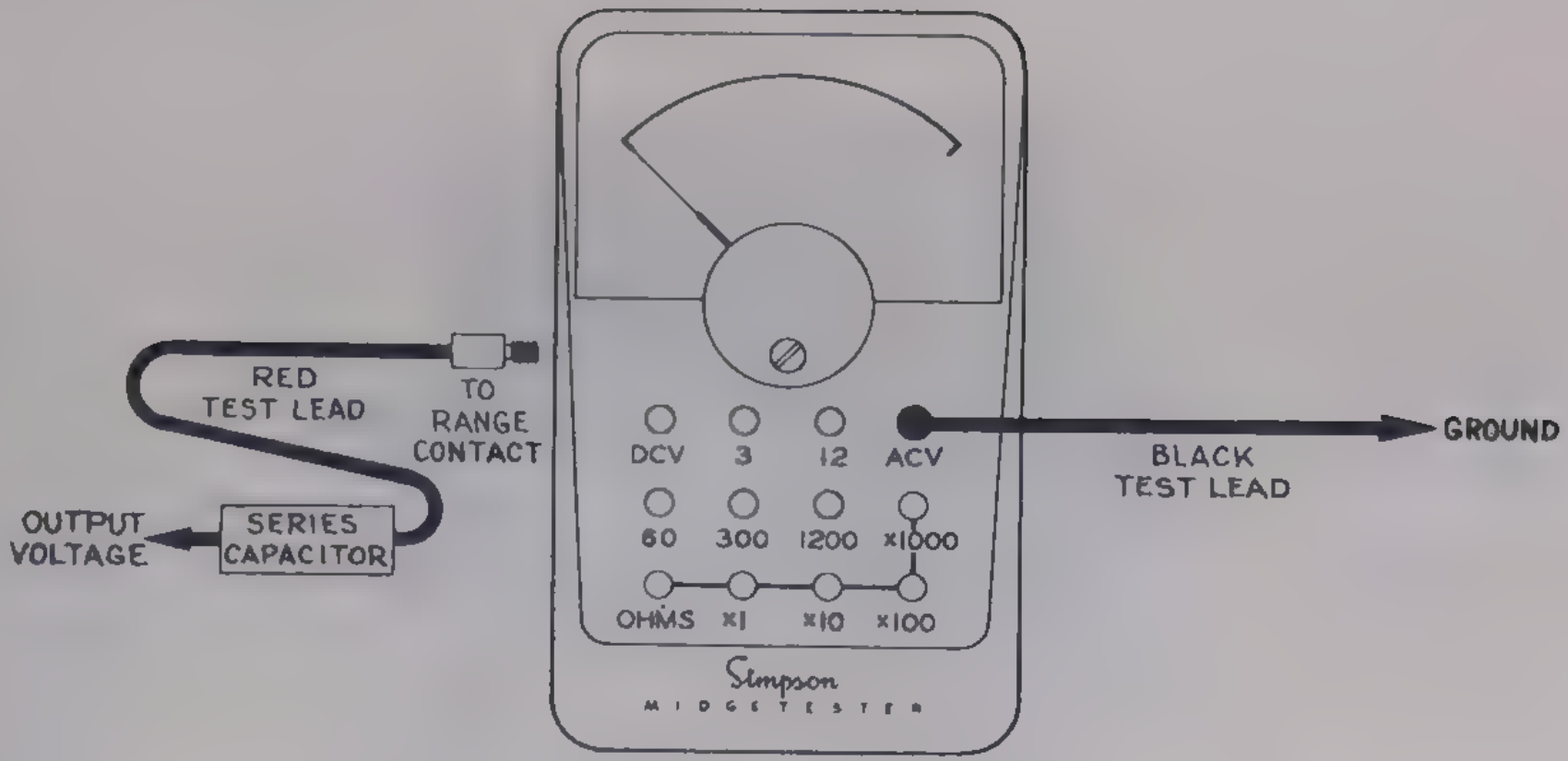


FIGURE 8. CIRCUIT FOR MEASURING OUTPUT VOLTAGES

SIMPSON SELF-SHIELDED CORE
MAGNET METER MOVEMENT

A WORD ABOUT THE SIMPSON CORE MAGNET METER MOVEMENT

Your Simpson Midgetester Model 355 is equipped with a Simpson Self-Shielded Core Magnet Meter Movement.

The increasing requirements for an extremely rugged movement for military and commercial use have brought about the design of the Simpson Core Magnet Meter Movement.

Low mass and concentric construction compactness, and self-shielded features make it particularly adaptable for these applications.

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

Arizona, Phoenix 85034 Metermaster/Phoenix 2633 E. Buckeye Road	Area Code 602 273-7331
California, Glendale 91201 JSD Engineering Company 6915 San Fernando Road	Area Code 213 849-6187
California, Los Angeles 90022 Metermaster/Los Angeles Division of Kierulff Elec., Inc. 5645 E. Washington Blvd.	Area Code 213 685-4340
California, Los Angeles 90007 Quality Electric Division of Kierulff Elec., Inc. 3700 South Broadway	Area Code 213 232-3501
California, Mountain View 94041 Kierulff/Metermaster 2484 Middlefield Road	Area Code 415 968-6292
California, San Diego 92111 Metermaster/San Diego 8137 Engineer Road	Area Code 714 276-5202
California, San Francisco 94105 Pacific Electrical Instrument Lab. 111 Main Street	Area Code 415 421-7185
Canada, London, Ontario Bach-Simpson Ltd. 1255 Brydges Street P.O. Box 484	Area Code 519 451-9490

Colorado, Denver 80209 Metermaster Instrument Corporation 748 So. Broadway	Area Code 303 722-8462
Connecticut, Middletown Mancib Company Randolph Road—PO Box 467	Area Code 203 Diamond 7-5629
Connecticut, New Haven 06511 Kaufman Instrument Labs Inc. 810 Dixwell Avenue	Area Code 203 776-7201
Florida, Miami 33136 Florida Precision Instrument Corp. 800 N.W. 7th Avenue	Area Code 305 374-1731
Florida, Orlando 32806 Electro Tech Inc. 307 - 27th Street	Area Code 305 423-5589
Georgia, Hapeville 30054 Electro-Tech, Inc. 3020 Commerce Way	Area Code 404 758-7205
Hawaii, Honolulu 96817 Electronic Systems Inc. 1622-26 Silva Street	851-457 811-132
Illinois, Chicago 60625 (Niles) A & M Instrument, Incorporated 7800 N. Merrimac	Area Code 312 966-8100
Illinois, Chicago 60644 Pacific Indicator Company 5924 W. Madison Street	Area Code 312 261-1330

Illinois, Chicago 60644 Simpson Electric Company 5200 W. Kinzie Street	Area Code 312 379-1121
Kansas, Shawnee Mission 66205 Sturtz Instrument Co. 4705 Mission	Area Code 913 236-4705
Louisiana, New Orleans 70115 Industrial Instrument Works 3305 Tchoupitoulas Street	Area Code 504 895-5621
Maryland, Timonium 21093 Edgerly Instrument Labs., Inc. 110 West Timonium Road	Area Code 301 252-1260
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Massachusetts, Needham Heights 02194 Instruments, Incorporated 570 Hillside Avenue	Area Code 617 444-9410
Michigan, Detroit 48220 Ram Meter, Inc. 1100 Hilton Road Ferndale	Area Code 313 547-1000
Minnesota, Minneapolis 55411 Instrumentation Services Inc. 917 Plymouth Avenue	Area Code 612 521-8803

Missouri, St. Louis 63112 Scherrer Instruments 5449 Delmar Blvd.	Area Code 314 367-9800
New Jersey, Belleville 07109 Marshall Instruments, Inc. 236 Washington Avenue	Area Code 201 751-1190
New York, Buffalo 14216 Electrical Instrument Labs. 932 Hertel Avenue	Area Code 716 876-0880
N. Y., Great Neck, Long Island 11022 Simpson Instrument Sales & Service, Inc. 130 Cutter Mill Road	Area Code 212 683-0674 Area Code 516 482-3103
New York, Great Neck, L.I. 11022 A & M Instrument, Inc. Community Drive	Area Code 516 487-0500
New York, New York 10011 Electro-Tech Equipment Company 85 Tenth Avenue	Area Code 212 675-2400
New York, Syracuse 13215 Syracuse Instrument Lab. 4895 South Avenue Box 96	Area Code 315 492-1651
New York, Vestal 13850 Compton Industries Inc. 333 Vestal Parkway East P.O. Box 351	Area Code 607 748-3349
North Carolina, Charlotte 28206 Electro-Tech Inc. 3107 Gullman Avenue	Area Code 704 333-0326

Ohio, Cleveland 44135 Weschler Electric Company 4250 W. 130th Street	Area Code 216 251-4609
Ohio, Cleveland 44103 Pioneer-Standard Electronics, Inc. 5403 Prospect Avenue	Area Code 216 432-0010
Ohio, Dayton 45404 SREPCO Electronics Div. of Pioneer Standard Electronic, Inc. 314 Leo Street	Area Code 513 224-0871
Oregon, Portland 97217 Industrial Instrument Repair Lab. 1910 N. Killingsworth St.	Area Code 503 285-6629
Pennsylvania, Philadelphia 19115 Sunshine Scientific Instrument 1810 Grant Avenue	Area Code 215 673-5600
Texas, Dallas 75204 Ultra Instrument Lab., Inc. 3515 Swiss Avenue, Suite 117	Area Code 214 826-6395 826-6396
D.C., Washington 20001 Electronic Wholesalers, Inc. 2345 Sherman Avenue N.W.	Area Code 202 483-5200
Washington, Seattle 98119 The Instrument Lab. Inc. 934 Elliott Avenue West	Area Code 206 283-5850
Wisconsin, Milwaukee 53202 The Electro-Mechano Company 261 East Erie Street	Area Code 414 272-4050

WARRANTY

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and *SIMPSON ELECTRIC COMPANY* neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

Quality is the indispensable component of every Simpson instrument . . . . . .